#10/C (2mos.)

BEFORE THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Title:	ELECTRIC FIELD SENSOR
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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Dear Sir:

This letter is in response to the office Action of September 8, 2003. A Petition for a two month extension of time within which to respond accompanies this letter.

Amendments

In the Disclosure

The disclosure has been amended at page 16. Schedule A attached shows the amendments being made to the disclosure.

In the Claims

Attached as Schedule B are the claims showing the amendments being made to claims 22, 33 and 34.

2252

Discussion

The Examiner has objected that the words "no greater than 50%" in claim 22 differs from "less than 50%". Claim 22 has been amended to reflect the words "less than 50%".

The Examiner has objected that the limitation in Claim 23 to "an unmodulated voltage signal" was not originally disclosed. Clearly, the disclosure addresses an "unmodulated voltage signal" as that is what is inherent in the circuits of Figures 1-4 and the associated disclosure. The disclosure states (page 15, lines 24-28):

> "an electrical sensor system incorporating a pick-up electrode 1 ... placed adjacent a first location 2 on a body 3 where an electrical signal is the be sensed ..."

Thus a heart signal is picked-up. Then it is passed to a voltage divider network.

Out of an abundance of caution, the disclosure has been amended in the paragraph on page 16 from lines 10 to 19 to add at line 1, after "Figure 1B", the words --an unmodulated output,--. It is inherent that a voltage divider network provides an unmodulated output.

In respect of Claim 33, this claim has been deleted.

The applicant attaches an article and several US patent references which the Examiner may wish to review. These refences are addressed in an IDS accompanying this Response.

On this basis, reconsideration and a favourable ruling is requested.

Respectfully submitted,

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Schedule A
Amendments to the Disclosure
in the Response dated February 9, 2004 in Serial No. 10/049,675

~~the~~ output V_o from the voltage divider network which drives the operational amplifier IC1A, shown in Figure 1B, **an unmodulated output,** is measured across input resistor R_I that extends between the input of the operational amplifier IC1A through circuit ground to a reference capacitor C_R that is coupled to the body 3 at a second, separate location 5. This location 5 may be separated from the first location 2 in obtaining conventional ECG signals. The locations 2,5 may also be proximate, e.g. adjacent, at certain body locations and still provide useful signals.

Schedule B
Claims as the Remain after Amendments in the Response dated February 9, 2004 in Serial No. 10/049,675

Claims 1-21 (Cancelled)

22. (Currently Amended) An electric potential sensor for detecting an electrical potential difference present over a source surface comprising:

(1) a voltage divider network including at one end a pick-up electrode with a face surface having an insulating layer positioned adjacent to said face surface for placement next to a source surface whose electrical field is to be sensed through capacitive coupling

(2) an electrical coupling at the other end of the voltage divider network for connection to another portion of the source surface over which an electrical potential difference exists; and

(3) voltage sensing means for providing a voltage output, said voltage sensing means having an input capacitance that forms a portion of the voltage divider network, the voltage sensing means being connected for measuring the voltage appearing across that portion of the voltage divider network provided by said input capacitance and for providing a voltage output that corresponds to the strength of said electrical potential difference

characterized in that the capacitance that can exist between the source surface and the voltage sensing means is sufficient so that, when the pickup electrode is placed adjacent the source surface, the change in the capacitive coupling between the voltage sensing means and the source surface arising from a change in the separation distance between the pickup electrode and said surface varies insensitively with displacement of the electrode towards or away from the surface whereby, upon variation of the separation

Schedule B
Claims as the Remain after Amendments in the Response dated February 9, 2004 in Serial No. 10/049,675

distance between the source surface and the pick-up electrode, the overall, effective capacitance formed in use between said source surface and the voltage sensing means through the pick-up electrode is such that the change in capacitance is ~~[no greater]~~ less than 50 percent when subjected to a 0.1 mm increase in said separation distance, and wherein the voltage sensing means has an input resistance that, when combined with the capacitance that can exist between the source surface and the voltage sensing means through the pick-up electrode, provides an RC filter with a low-frequency cut-off of at least 0.05 hertz.

Cont.

23. (Original) A sensor as in claim 1 wherein the voltage output of the voltage sensing means is an unmodulated voltage output that corresponds to the strength of said electrical potential difference.

24. (Original) A sensor as in claim 1 wherein the percentage change in capacitance is less than 20% when a 0.1 mm increase in the separation distance occurs.

25. (Original) A sensor as in claim 1 wherein said insulating layer is of such dimensions as to preclude the electrode from providing a capacitance value of over 40 picoFarads/cm^2.

26. (Original) A sensor as in claim 1 wherein said insulating layer is of such dimensions as to preclude the electrode from providing a capacitance value of over 20 picoFarads/cm^2.

27. (Original) A sensor as in claim 1 wherein said insulating layer is of such dimensions as to preclude the electrode from

Schedule B

Claims as the Remain after Amendments in the Response dated February 9, 2004 in Serial No. 10/049,675

providing a capacitance value of over 10 picoFarads/cm^2.

28. (Original) A sensor as in claim 1 comprising a series capacitor, positioned within said voltage divider network between said pickup electrode and the voltage sensing means, said series capacitor having a value in picoFarads of less than five times the area of the pick-up electrode in cm^2.

29. (Original) A sensor as in claim 7 wherein said series capacitor has a value of between 5 and 40 picoFarads.

30. (Original) A sensor as in claim 1 comprising a leakage resistor in parallel with the input capacitance of the voltage sensing means of between 10^{11} and 10^{13} ohms.

31. (Original) A sensor as in claim 1 comprising a capacitive coupling for connection to the source surface at the end of the voltage divider network opposite the pick-up electrode.

32. (Original) A sensor as in claim 1 comprising a resistive-contact coupling for connection to the source surface at the end of the voltage divider network opposite the pick-up electrode, said resistive contact coupling having a resistance value of 500 k ohms, or less.

33. (Currently Cancelled) ~~[A sensor as in claim 1 having a conductive element positioned over the insulating layer on the~~

Schedule B

Claims as the Remain after Amendments in the Response dated February 9, 2004 in Serial No. 10/049,675

~~externally directed side of the face surface of the pick-up electrode to reduce the effects of externally generated electrical noise.]~~

34. (Currently Amended) A sensor assembly system comprising ~~[two sensors as in claim 1 to be]~~ **a first sensor as in Claim 1 and a second sensor as in claim 1** adapted to be applied at a spaced separation over the source surface, said **first and second** ~~[two pick-up]~~ sensors being connected to a differential amplifier to obtain the difference in the output signals from two locations on the surface with common mode noise rejection.

35. (Original) A sensor assembly comprising multiple sensors each as in claim 1 assembled on a carrier to locate the pick-up electrodes of each sensor in a fixed, preformated array.

36. (Original) A sensor assembly as in claim 14 wherein the carrier is a piece of clothing that can be readily donned or removed with minimal inconvenience.

37. (Original) A sensor assembly as in claim 14 combined with tele-monitoring means.

38. (Previously Amended) A method of sensing an electrical potential difference present over a surface comprising:

(1) presenting a pickup electrode to confront said surface and to establish a capacitive coupling to said surface

Schedule B

Claims as the Remain after Amendments in the Response dated February 9, 2004 in Serial No. 10/049,675

and receive a signal based upon the electric field emanating therefrom;

(2) applying the signal so received to a voltage divider network which includes at one end the pick-up electrode and at another end an electrical coupling means connected to another portion of the surface over which an electrical potential difference exists, there being a high impedance amplifier with an input capacitance connected in series within said voltage divider network, the high impedance amplifier having an input resistance that, when combined with the capacitance that can exist between said surface and the high impedance amplifier through the pick-up electrode, provides an RC filter with a low-frequency cut-off of at least 0.05 hertz;;

(3) maintaining the pickup electrode at a spaced separation from the confronted, field-emanating surface so that the overall effective capacitance between said surface and said amplifier has a value in the region of a plot of capacitance value versus separation distance wherein the percentage change in capacitance is no greater than 50 percent when subjected to a 0.1 mm increase in the separation distance occurring between the pick-up electrode and the confronted surface

whereby a signal is provided to the amplifier to provide an amplifier output voltage that corresponds to the strength of said electrical potential difference, and wherein the capacitive coupling between the field-emanating surface and the amplifier

Schedule B

Claims as the Remain after Amendments in the Response dated February 9, 2004 in Serial No. 10/049,675

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through the pickup electrode varies insensitively with displacement of the electrode away from said surface.